Analysis of Brownfield Cleanup Alternatives
USEPA Brownfields Cleanup Grant #973466-01-2

NVF-Yorklyn, Yorklyn, Delaware 19707
DE-1461

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1.0 INTRODUCTION

The objective of this report is for the Delaware Department of Natural Resources and Environmental Control (hereinafter the Department or DNREC) to conduct an Analysis of Brownfield Cleanup Alternatives (ABCA) pursuant to an interim action at the NVF-Yorklyn facility located in Yorklyn, Delaware (site). The interim action is necessary to facilitate the final phase of a Remedial Investigation to determine the extent of hazardous substances in the soils and groundwater beneath the area that is currently covered by remaining buildings. The interim action will involve the removal of asbestos containing material (ACM) and demolition of building structures. Environmental sampling will then commence beneath the foundations of demolished buildings to fill existing data gaps that are inhibiting the completion of Remedial Investigation and Feasibility Study assessments at the site. This ABCA report will serve as a feasibility study for the best practical approach to conduct the interim action.

The NVF-Yorklyn site was certified as a brownfield under applicable Delaware law (7 Del. C. Chapter 91, Hazardous Substance Cleanup Act, hereinafter HSCA) and all regulations pursuant thereto, on October 3, 2007 in a letter addressed to Mr. Dennis P. Snavely of CCS Investors, Inc. CCS Investors, Inc. subsequently sold sections of the NVF-Yorklyn site to various persons and these parties became assignees to the Brownfields Development Agreement (BDA) executed on March 27th, 2009 by the Department and CCS Investors. One of the assignees of the BDA was Auburn Village LLC, the RLF applicant, who acted as a co-developer of the site with CCS Investors (DNREC's Division of Parks & Recreation was another assignee). Use of the property did not change from the time of application for certification to the time of purchase by the applicant, nor has any remedial action taken place on the section of the property in Auburn Village LLC's control, prior to the purchase by the applicant.

Auburn Village, LLC was afforded liability protection and any remaining brownfield grant funding left after use by CCS Investors, Inc. Subsequent investigations indicated the need to test soils under certain buildings at the site in order to complete the master use redevelopment plan. This additional work required financial assistance by the applicant and the Department offered BFRLF monies as leverage to keep the redevelopment solvent.

2.0 SITE INFORMATION

The site is located at 1166 Yorklyn Road in Yorklyn, New Castle County, Delaware, approximately two miles south of the Pennsylvania and Delaware state line. The Red Clay Creek

and Route 82 (running parallel to each other) border the Site to the north, south and east. Yorklyn Road borders the Site to the west.

Manufacturing processes at the Site have included:

- Paper Making. The making of paper and vulcanized paper products at the NVF Site and the Marshall Brothers Paper Mill.
- Vulcanization. The vulcanization of paper products was performed by saturating the paper products with zinc chloride.
- Zinc Reclamation. The zinc chloride solutions used in the vulcanization process were removed from the vulcanized paper product by a leaching process. The reclaimed zinc chloride was concentrated through the use of evaporators, recycled by precipitation at a zinc reclamation plant and was returned to the process for reuse.

Although the plant is no longer actively producing vulcanized paper products, the zinc reclamation process is currently in operation which includes reclaiming zinc from groundwater beneath the facility.

Topography at the site ranges from gently to steeply sloping. The lowest elevation is generally located near Yorklyn Road and Red Clay Creek. Surface water drains towards Red Clay Creek which is located north of the site. An unnamed tributary (also referred to as the onsite ditch), located east of Yorklyn Road flows through the site in a northeasterly direction toward Red Clay Creek.

3.0 SOURCES AND EXTENT OF CONTAMINATION

The results of ongoing soil and groundwater evaluations, as well as an asbestos containing materials evaluation, have been used to determine the sources and extent of contamination associated with the NVF-Yorklyn facility, so far as the collected data will afford**. The full extent of soil and groundwater impacts from site operations cannot be completed until the remaining facility structures are demolished.** Once demolished, DNREC will be able to complete soil and groundwater assessment activities associated with a Remedial Investigation at the site, and subsequently perform a Feasibility Study to develop a comprehensive cleanup plan for the site.

The requested BFRLF money is intended to be used for asbestos containing materials removal and/or building demolition in order to facilitate completion of the Remedial Investigation at the site. Any discussion contained herein related to soil and/or groundwater contamination is provided for background information only, as the requesting funding will not be used to complete the referenced soil/groundwater investigations.

3.1 Asbestos Containing Materials (ACM)

Harvard Environmental, Inc. has provided data associated with ACM inspections performed at the NVF-Yorklyn facility in September 2010. These inspections were performed only on the buildings located to the East of Yorklyn Road, and were limited to facilities located west of the

Wilmington Western Railroad, where BFRLF funds are proposed for use. Conclusions and recommendations from Harvard Environmental, LLC's assessment are that **damaged and significantly damaged asbestos materials are associated with the facilities as evidenced by asbestos containing debris**. Specifically:

- Damaged and significantly damaged asbestos materials are located within with the facilities and on ground surfaces which requires remediation. Minimum action at the facilities should be to regulate those areas containing debris in order to draw attention to the potential hazard and minimize potential exposures and migration.
- If over the course of project execution, materials of questionable content are discovered, additional inspections then will be required in order to maintain compliance with Federal and State regulations.
- Asbestos is expected to be significantly impacted during demolition of this facility. Planning, design strategies and specifications will need to be enlisted in order to fully address all issues and materials identified during the assessment.
- Removal of any asbestos containing materials must be conducted by a State of Delaware licensed asbestos contractor.

3.2 Zinc in Soil and Groundwater

Based upon the historic uses of the property described in Section 2 above, it is not surprising that soil and groundwater have been impacted by zinc chloride. Recent groundwater data has shown zinc concentrations up to 1,070,000 micrograms per liter (ug/L, or ppb) in groundwater (Environmental Alliance, 2014). Soil data has just recently been gathered in areas of the site where sample collection was possible (in support of a Remedial Investigation for the site). It is anticipated that concentrations of zinc in groundwater beneath the existing facility buildings may be higher, as most of the zinc reclamation process occurred there.

While operating, NVF used an on-site zinc reclamation system to recover significant quantities of zinc from its process water. The zinc-contaminated water was piped to a Zinc Reclamation Plant west of Yorklyn Road, where it was treated and discharged to the New Castle County sewer system through an on-site lift station. The discharge was permitted under a New Castle County - Department of Special Services wastewater discharge permit (WDP 76-028).

In 2008, NVF contracted Environmental Alliance, Inc. to construct a groundwater recovery and treatment system at the site. The system employs a groundwater recovery trench to intercept zinc laden groundwater migrating to the Red Clay Creek. The water from the trench was initially pumped to NVF's Zinc Reclamation Plant for treatment and subsequent discharge. However, in 2010 the Zinc Reclamation Plant and other structures west of Yorklyn Road were placed out of service and subsequently demolished as part of a program administered by the Federal Emergency Management Agency (FEMA) to eliminate the potential for flood damage in the highly susceptible area. At that time, Environmental Alliance installed a Mobile Zinc Remediation System to treat the recovered groundwater prior to discharge to the New Castle County wastewater system, which enabled continued operation of the groundwater recovery trench. The mobile zinc treatment system was designed to enable rapid disconnect and relocation

to a safe location on high ground during periods of potential flooding of the Red Clay Creek. Currently, DNREC maintains control of the groundwater treatment system.

Approximately 9,337 gallons of zinc hydroxide sludge was removed from the onsite groundwater zinc recovery systems in 2013, and an estimated 59,344 pounds of zinc have been removed from the groundwater beneath the site via the treatment system since it was constructed in 2008. DNREC has plans to expand the treatment system after demolition of the remaining buildings by installing two additional recovery wells and piping them into the existing system. This work cannot be completed until remaining structures are cleared of ACM and demolished through the proposed effort.

3.3 Other Hazardous and Non-Hazardous Substances

In 2013, DNREC coordinated removal of all remaining hazardous and non-hazardous (zinc containing) waste from remaining structures that posed a potential threat to human health and/or the environment prior to building demolition. ACMs were not part of DNREC's removal efforts. The following materials were completely removed from the interiors of the remaining facility buildings and were transported to permitted disposal facilities in 2013:

- 143,530 lbs. of zinc chloride containing solid waste
- 60,740 lbs. of sodium hydroxide solid waste
- 2,382 lbs. of hydrochloric and sulfuric acid waste
- 10 lbs. of mercury containing solid waste
- 23,460 lbs. of soda ash
- 800 lbs. of paint-related wastes

Activities at the site in 2014 have been no different. DNREC contractors have recently (early 2014) completed the removal of thousands of additional pounds of zinc containing solid waste and other waste in preparation for the continuation of asbestos removal and building demolition associated with this BFRLF loan.

4.0 EXPOSURE PATHWAYS

This section provides information on the potential exposure pathways for asbestos, zinc and other hazardous and non-hazardous contaminants associated with the NVF-Yorklyn facility.

4.1 Asbestos

Harmful exposure to asbestos is typically from friable ACM, which has been identified in the boiler house and surrounding buildings at the NVF-Yorklyn facility. Non-friable ACM can become friable when pulverized (during building demolition) or severely damaged/deteriorated. Potential exposure pathways for asbestos fibers from the facility buildings at NVF-Yorklyn include inhalation, ingestion, and contact with skin and/or eyes. Exposure to site workers, including demolition contractors, is possible if not properly remediated prior to demolition activities. In addition, airborne asbestos could be potentially harmful to the surrounding community if not properly removed prior to building demolition.

4.2 Zinc

Potential exposure to zinc contaminated dust and debris from the existing building structures may result in hazards due to inhalation, ingestion, and/or contact with skin and/or eyes. The greater risk, however, is due to zinc contaminated dust and debris washing into the Red Clay Creek, where ecologically sensitive receptors reside, and where a Total Maximum Daily Load (TMDL) and waste load allocation (WLA) have been established (WLA of 25.17 pounds per day of zinc discharge is allowed). Every effort is being made at the site to reduce or eliminate surface runoff containing zinc from entering the numerous surface water inlets that exist at the former NVY-Yorklyn manufacturing facility.

4.3 Other Hazardous Substances

All of the other hazardous and non-hazardous materials removed from the interiors of site buildings in 201/2014 could have been released to the surrounding environment and/or Red Clay Creek over time from either deterioration of its containment or from being accidentally released during building demolition activities. Exposure pathways would include direct contact, inhalation, and/or ingestion. Since other hazardous and non-hazardous substances remaining in site buildings have been properly removed for disposal, there is no longer a complete exposure pathway for these substances.

5.0 APPLICABLE LAWS AND CLEANUP LEVELS

This section provides information on the applicable laws and regulations for the contaminants of concern associated with this BFRLF funded interim action.

5.1 Asbestos

Asbestos is regulated on the federal level by the Clean Air Act (CAA), the Toxic Substances Control Act (TSCA), the Asbestos Hazard Emergency Response Act (AHERA), and the Asbestos School Hazard Abatement Reauthorization Act (ASHARA). The USEPA enforces these laws through the Code of Federal Regulations (CFR) at 40 CFR 61 Subpart M, which is the National Emission Standard for a Hazardous Air Pollutant NESHAP) – asbestos regulations, and at 40 CFR 763. At the State level, asbestos is regulated under the DNREC Division of Air Quality's Asbestos Abatement Program. The aforementioned inspection by Harvard Environmental (2010) provided compliance with 40 CFR 61, "Asbestos NESHAP" and applicable State regulations. These Environmental Protection Agency (EPA) and DNREC regulations require asbestos inspections to be performed by certified asbestos building inspectors prior to renovations and/or demolition of facilities. Representative sampling of suspect asbestos building materials was performed on building materials. The sampling effort was conducted in accordance with EPA and State regulations and industry accepted standards.

Asbestos in the workplace is regulated by the Occupational Safety and Health Act, which is enforced by the U.S. Occupational Safety and Health Administration (OSHA). The applicable regulations are codified in the general industry standard (29 CFR 1910.1001), the hazard communication standards (29 CFR 1910.1200 and 29 CFR 1926.59), and the construction industry standard (29 CFR 1926.1101). The USEPA created the Worker Protection Rule (40 CFR 763 Subpart G) to extend these OSHA standards to public sector employees not already covered by the OSHA standards. The U.S. Department of Transportation (DOT) regulates the transportation of friable asbestos under the Hazardous Materials Transportation Act (HMTA). The DOT hazardous material regulations are codified at 49 CFR 171 through 49 CFR 180.

Asbestos analysis at the NVF-Yorklyn site was completed utilizing Polarized Light Microscopy, (PLM). PLM utilizes an optical microscope equipped with a polarizing lens through which a trained microscopist can identify asbestos fibers according to their crystalline structure. This method of analysis is recognized throughout the industry as standard practice. Prior to determining the type of fiber, the sample was placed under a "Stereo Microscope" at approximately 150X magnification for purposes of visual estimation. Various fiber types were pulled from the sample and oils applied to determine refractive indices under the polarized light microscope. This recognized method of analysis has a detection limit of 1% by volume. Percentages of asbestos < 1% were reported as "trace" and were not considered asbestos containing materials under EPA regulations.

Some of the ACM, such as pipe insulation in the boiler room and surrounding buildings, is already friable, and likely to become airborne during demolition activities. In addition, when nonfriable ACM is present, the cost of Building renovation and/or removal increases due to the extra precautions that must be taken to protect against worker exposure to asbestos and due to the added transportation and disposal costs for certain ACM-containing waste streams. Therefore, the removal of all ACM from the remaining buildings is necessary prior to any future demolition or building rehabilitation activities, and will be conducted in accordance with all Federal and/or State rules and regulations.

5.2 Zinc

Federal and State rules and regulation for zinc are typically based upon acceptable risk to receptors. Development of USEPA hazard identification and dose-response assessments for zinc and compounds has followed the general guidelines for human health risk assessment as set forth by the National Research Council (1983). EPA guidelines that were used in the development of this assessment include the following: *Guidelines for the Health Risk Assessment of Chemical Mixtures* (U.S. EPA, 1986a), *Guidelines for Mutagenicity Risk Assessment* (U.S. EPA, 1986b), *Recommendations for and Documentation of Biological Values for Use in Risk Assessment* (U.S. EPA, 1988), *Guidelines for Developmental Toxicity Risk Assessment* (U.S. EPA, 1991), *Interim Policy for Particle Size and Limit Concentration Issues in Inhalation Toxicity* (U.S. EPA, 1994a), *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry* (U.S. EPA, 1994b), *Peer Review and Peer Involvement at the U.S. Environmental Protection Agency* (U.S. EPA, 1994c), *Proposed Guidelines for Neurotoxicity Risk Assessment* (U.S. 1995a), *Use of the Benchmark Dose Approach in Health Risk Assessment* (U.S. EPA, 1995b), *Guidelines for Reproductive Toxicity Risk Assessment* (U.S. EPA, 1996),

Science Policy Council Handbook: Peer Review (U.S. EPA, 1998), and *Guidelines for Carcinogen Risk Assessment* (U.S. EPA, 2005).

As such, the carcinogenicity assessment provides information on the carcinogenic hazard potential of the substance in question and quantitative estimates of risk from oral and inhalation exposure. The information includes a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen and the conditions under which the carcinogenic effects may be expressed.

Zinc is regulated similarly at the State level under Delaware's Hazardous Substance Cleanup Act (HSCA) Regulations. Risk-based cleanup standard for soil and groundwater that contains elevated concentration of zinc will be developed through a human health and ecological risk assessment conducted as part of the Remedial Investigation/Feasibility Study for the site. These reports cannot be completed until the remaining buildings are property demolished and soil and groundwater beneath the structures is evaluated.

6.0 ANALYSIS OF CLEANUP ALTERNATIVES CONSIDERED

Three reasonable alternatives were considered for this interim action: 1) taking no action, 2) only removing ACM and leaving buildings in place for rehabilitation and 3) removing the ACM and demolishing buildings. While a no-action alternative was not considered a viable alternative, an evaluation of such a strategy is required as part of the ABCA for the BFRLF loan. Although two of the options involve leaving facility buildings in place, the need to assess environmental conditions beneath the building structures and develop appropriate cleanup alternatives for the entire site preclude the viability of these options. Therefore, removal of the ACMs followed by building demolition is the preferred cleanup alternative.

6.1 No Action

A no-action alternative would leave the building structures in place, and in their present condition, making further soil and groundwater investigation impossible. The only advantage to this strategy would be the avoidance of expenses incurred by taking action. The continued presence of ACM would pose long-term health risks to anyone working in or around the buildings (such as maintenance personnel). In addition, the structural integrity of the buildings is already suspect, and further disregard to condition may increase risks to other surrounding site development and occupation in the future. Direct costs for the no-action strategy include fees for maintenance, continues inspections into the condition of identified ACM. These costs are estimated at $1,000.00 per month at present, with adjustments for cost-of living increases. Indirect costs include the diversion of funds from other projects or operations and the loss of potential income from renting office or retail space after final redevelopment of the former NVF-Yorklyn facility and surrounding areas. The effectiveness, implementation, and costs associated with the no-action alternative are summarized as follows:

- **Effectiveness –** Ineffective in protecting human health and the environment from ACM and general structural safety issues; Ineffective at allowing for additional soil and

groundwater contamination investigation to complete a comprehensive site cleanup plan; Negligible effect towards accomplishing future land use goals;
- **Implementation –** Simple, straightforward, and easy to implement;
- **Cost –** Minimal in the short term, but could be a very expensive alternative considering the continued maintenance expenses and the revenue lost from not using this centralized portion of the property. In addition, the condition of the buildings may require demolition in the future, after other area redevelopment has occurred.

6.2 Removing ACM and Leaving Buildings In Place for Rehabilitation

In order to reuse the facility buildings, the ACM would have to be either entirely removed or partially removed and managed in place. In addition, the buildings would have to be completely renovated so as to make the exterior water tight, to bring the structure into compliance with modern building codes and the Americans with Disabilities Act (ADA), and to upgrade and repair the internal wiring and HVAC systems. The advantages to the reuse alternative include retaining the structures (although there is no historical significance to the buildings proposed for demolition) and not having to dispose of construction and demolition debris. The major disadvantage to the reuse alternative is the cost. As mentioned above, the structural integrity of the buildings is already suspect. Rehabilitation costs, *after removal of the ACM*, could be in the 3 to 5 million dollar range, just to get the shell of the structures into compliance with current code. Renovation costs associated with potential occupants would be an additional cost. Estimates to remove the ACM only is in the range of $800,000 (all costs in Section 6.0 will reflect prevailing wage when presented for reimbursement). The effectiveness, implementation, and costs associated with the reuse alternative are summarized below:

- **Effectiveness –** Effective at mitigating the risks to human health and the environment from ACM; Ineffective at allowing for additional soil and groundwater contamination investigation to complete a comprehensive site cleanup plan; Negligible effect towards accomplishing future land use goals.
- **Implementation –** Requires additional analysis and planning to create renovation plans for the buildings. Also, requires a step-wise implementation of ACM abatement and renovation phases. Of all the alternatives, this would be the most difficult to implement.
- **Cost –** Most expensive alternative with an estimated cost of $4M to $6M just to make buildings structurally sound and ready for renovation. Renovation costs would be an addition, and based upon future inhabitants.

6.3 Removal of ACM and Building Demolition

Removal of the facility building and all associated ACM is the most effective cleanup alternative considered. This plan of action would completely remove all risks to human health and the environment associated with the existing structures, and would allow for assessment and cleanup of impacted soil and groundwater beneath for the former manufacturing facility. It would eliminate the uncertainties and exceedingly high cost involved with renovation and retrofit of the existing buildings. Implementation would involve two steps: 1) the removal of ACM by a licensed asbestos contractor and 2) the removal of the buildings themselves. Once ACM is removed, the building debris waste stream can be disposed of as non-hazardous materials, at a

construction and demolition debris landfill. Step 1, the ACM removal, is estimated to cost approximately $800,000. Cost estimates for Step 2, the removal of the building, range from $400,000 to $600,000.

Although new buildings may be constructed in the future, it is unlikely that a building will be constructed in the same location as the existing buildings. In fact, the location of the remaining site buildings is being considered for full excavation and creation of a flood bank/wetland habitat to reduce known flooding issues is the general site area. Until the buildings are taken down, and assessment of the underlying soil and groundwater can be accomplished, final future use cannot be determined. The effectiveness, implementation, and costs associated with the ACM removal and demolition alternative is summarized below:

- **Effectiveness –** Very effective at mitigating the risks to human health and the environment and accomplishing the land use goals; Very effective in allowing for additional soil and groundwater contamination investigation to complete a comprehensive site cleanup plan;
- **Implementation –** Requires only two steps: removal of ACM, and demolition/disposal. More difficult to implement than taking no action, but simpler than the reuse alternative; and
- **Cost –** Least expensive alternative with an estimated cost of $1.2 to $1.4M total cost.

7.0 PROPOSED CLEANUP PLAN

Removal of ACM and demolition of buildings is the proposed cleanup plan. This proposed cleanup plan will result in complete remove the above-ground risks to human health and the environment associated with the buildings, and allow for the evaluation of subsurface soil and groundwater risks to human health and inhabitants of the adjacent Red Clay Creek. All remediation activities will be conducted in accordance with applicable federal and state laws and regulations, which are specified in *Section 5* of this report.

REFERENCES

Environmental Alliance, 2014. Data Transmittal of November 2013 Groundwater and Surface Water Sampling Event, Former NVF-Yorklyn Facility. February 2014.

Harvard Environmental, 2010. NVF Facilities – East Parcel, Yorklyn, Delaware. Asbestos NESHAP Inspection. September 2010.